# The ArkLaMiss Observer

*Spring/Summer 2011 Edition*

## INSIDE THIS EDITION!



## Historic April Tornado Outbreak

*By Alan Gerard, Meteorologist-in-Charge*

As everyone is aware, this spring was one of the most active in the United States for tornadoes in many years. From early April through early June, there were several major episodes of severe weather and tornadoes over much of the eastern half of the United States, including locations where spring severe weather is not as common such as Minnesota, Wisconsin and New England. As of July 26th, there have been 537 confirmed tornado fatalities nationwide, which is the largest number of tornado related deaths in the U.S. since 1936. These fatalities are the result of about 1150 confirmed tornadoes, which would be the normal number of tornadoes for an entire year. Five EF-5 tornadoes have occurred this year, which is the first time that many have occurred in the same year since 1974 when six F5 tornadoes occurred during the April 3-4, 1974 "Super Outbreak." The only other year in which five F5 tornadoes have occurred in the same year since records have been kept was 1953, which was another particularly violent year for tornadoes with 519 fatalities.

The ArkLaMiss region has of course been greatly impacted by this intense period of weather. While we had substantial outbreaks of severe thunderstorms and tornadoes on April 4th and 15th, the most damaging period of severe weather occurred from the late evening of April 26th through the early evening of April 27th. During that time period, we had 32 confirmed tornadoes in the area that NWS Jackson serves across southeast Arkansas, northeast Louisiana, and Mississippi. The only outbreak of tornadoes in a 2-day period that surpasses this event is the Hurricane Rita tornado outbreak in September 2005, when 55 tornadoes touched down in the NWS Jackson area on September 24th and 25th. The tornadoes with this most recent April outbreak were, however, much more damaging and intense than the tornadoes associated with the Rita

outbreak, with many more strong and violent tornadoes.

This event initially started out as supercell thunderstorms producing large hail and tornadoes across northeast Texas and portions of Arkansas before evolving into a squall line on the evening of the 26th. This line of storms moved east across much of the ArkLaMiss along and north of Interstate 20 during the late evening hours of the 26th and the early morning hours of the 27th. The line was very efficient in producing wind damage as it pushed east. More impressively, this line produced many tornadoes and is responsible for 23 of the total tornadoes for this event. Of those 23, 11 were rated as strong (EF2, EF3) tornadoes and had fairly long path lengths. The most intense tornado was a 59 mile long EF3 tornado which impacted northern Choctaw, southeast Webster, western Clay, Chickasaw and Monroe counties. A mile wide at its maximum width, this tornado caused extensive damage, including heavy damage to a school in the Cumberland community.

Once this line of storms moved east of the area, there was a break of several hours before supercell thunderstorms redeveloped during the early afternoon hours of the 27th. These storms intensified and by mid-afternoon began producing significant tornadoes. An additional 9 tornadoes would occur in the area during the afternoon hours. The first tornado of the day was the most intense, becoming the first EF5 tornado in the NWS Jackson service area since 1971. This tornado began on the north side of the city of Philadelphia, and moved northeast across northeast Neshoba, extreme northwest Kemper, extreme southeast Winston, and southwest Noxubee counties. The most impressive damage occurred in the rural area where Neshoba, Kemper, and Winston counties meet. Here, the ground was churned up by the tornado to a depth of up to two feet in several swaths. In addition, pavement was also torn from road surfaces and thrown significant distances.

**Figure 1(top). Asphalt removed from the road in the path of the tornado. Figure 2. (bottom). Ground torn up from a field due to the strength of the tornado winds.**

Damage experts consulted by NWS Jackson suggested that this was indicative of EF5 damage. Unfortunately, three people lost their lives in this tornado, and several others were injured. Another violent tornado occurred this same afternoon, an EF4 tornado that started in Smith County near Raleigh, and then moved across Jasper and Clarke counties. This tornado would then continue into southwest Alabama, with a total path length of 123 miles. Seven people were killed and 35 were injured by this tornado which reached six tenths of a mile in width at its maximum point.

In total, 12 people sadly lost their lives in the ArkLaMiss during this severe weather event: 11 deaths were due to tornadoes and 1 due to damaging straight line winds. Seventeen strong or violent tornadoes occurred in about an 18 hour period, including 5 EF3s, 1 EF4 and 1 EF5. Along with the EF5 tornado that occurred in Smithville (NWS Memphis service area), Mississippi became the first state since Kansas in 1991 to have two EF5 tornadoes occur on the same day. Numerous strong and violent tornadoes also occurred across Alabama, Tennessee, and Georgia during this event, and in total 314 people were killed during this tornado outbreak. Additionally, April 2011 set a record for the most tornadoes in any month in Mississippi with 63. The previous record was 44, set during the Rita outbreak of September 2005.

Luckily, after this weather episode, there was a significant change in

the weather pattern, and severe weather was much less prevalent over the next few weeks. However, by the end of May, the weather pattern again became active, and several tornado episodes occurred across the Midwest and South. On May 22nd, the deadliest tornado in nearly 100 years occurred in Joplin, MO, where 141 people were killed by an EF5 tornado. Later that week, the last spring severe weather episode of this busy year occurred in the ArkLaMiss region, with an EF2 tornado in Ashley and Chicot counties in Arkansas, as well as several reports of wind damage over the Delta region.

2011 will definitely go down in U.S. history as one of the most destructive as far as severe weather and tornadoes.

While the threat of tornadoes becomes much less in the ArkLaMiss region in the summer months, the risk for hurricanes means that tornado events can still occur. Even though the tornado risk is less in the South, summer is the peak of tornado season for the northern Plains, upper Midwest and New England regions. Of course, later this year the fall tornado season will bring a new possibility of tornadic activity to our region once again.

One can only hope that the rest of this year will not bring more destruction to add to 2011's already heavy tally of damage and heartache.

# MIGHTY MISSISSIPPI RIVER FLOOD OF 2011

*By Jared Allen, Forecaster and Marty Pope, Senior Hydrologist*

"April showers bring May flowers" is an old adage that simply reminds most that the mid to late spring months can bring life-giving rain to help wildlife and plants through the dry summer months. However, for locations across the Mid-Mississippi River and Ohio River Valleys, these April showers turned into excessive rainfall which, combined with a large amount of snow melt, caused some of the worst flooding ever recorded along the Lower and Mid-Mississippi River Valleys. From April 23rd through May 7th, the Mid-South experienced over 5 times the normal amount of rainfall, with some select locations receiving nearly 10 times or 1000% of their normal amount as several moderate to heavy rainfall events occurred along a stalled-out boundary draped across the mid-section of the country (Figure 1).

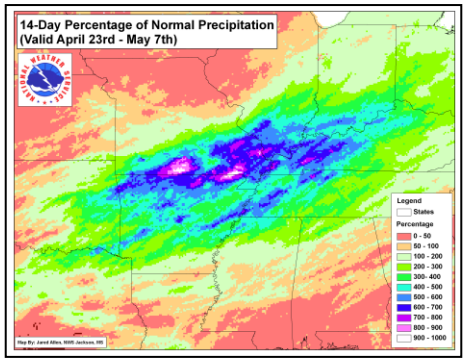


**Fig. 1: 14-Day Percentage of Normal Precipitation (4/23-5/7).**

Excessive heavy rain of 5 to 20 inches fell during the April 22nd - 27th time frame across northern Arkansas, southern Missouri, and up the Ohio River Valley. This amount prompted a major upward surge in river height forecasts for the Mississippi River and its tributaries. During the beginning of May, an additional 3 to 9 inches occurred across the same area, compounding the flash flooding and river flooding risk. Over the two month period of from April 1st to June 1st, a total of 30 to 35 inches of rain fell over parts of southern Missouri, which is roughly 300-400% of normal (Fig 2 & 3).

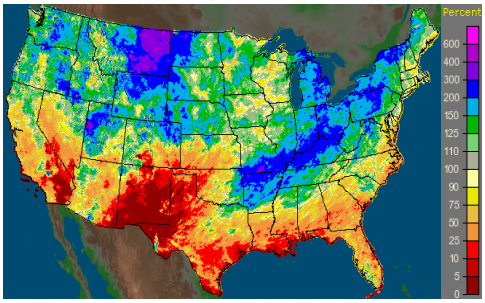


**Fig 2: Past 60-day Percentage of Normal of Rain. Totals from June 1st, 2011.**

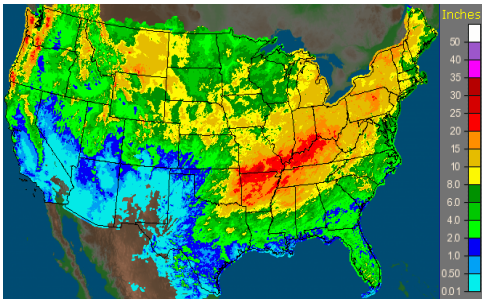


**Fig 3: Past 60-day Rain Accumulation. Totals from June 1st, 2011.**

These rainfall totals combined with moderate to major flooding coming down from the Upper Mississippi River due to snow melt. This pushed the crest forecast past the 1937, 1973, and 2008 flood levels at Arkansas City and Greenville, and even to record flood crests at Vicksburg and Natchez. The backwater areas up the Yazoo River crested above all previous records except 1927 levels, and were 6 to 7 feet higher that 2008 river levels. The table below shows forecast crest stages and dates issued by the National Weather Service on May 2nd, as well as actual crests and dates.

From the beginning of the predicted flooding until after the river crested and fell below flood stage, NWS Jackson coordinated with numerous county, state, and federal agencies regarding impacts.

| Gage Site | Forecast Crest & Date | Actual Crest & Date |
|---|---|---|
| *Memphis* | 48.0 ft on 5/10 | 47.9 ft on 5/10 |
| *Helena* | 56.0 ft on 5/12 | 56.5 ft on 5/13 |
| *Arkansas City* | 53.5 ft on 5/14 | 53.14 ft on 5/16 |
| *Greenville* | 64.5 ft on 5/15 | 64.22 ft on 5/17 |
| *Vicksburg* | 57.5 ft on 5/18 | 57.10 ft on 5/19 |
| *Natchez* | 65.0 ft on 5/20 | 61.95 ft on 5/19 |

**Table 1. Forecast and actual crests and dates for points on the Mississippi River.**

NWS Jackson collaborated with the United States Army Corps of Engineers (USACE) in Vicksburg, to provide potential flood inundation maps for the public. The river finally crested in mid May, with most points not falling below flood stage until the first and second weeks of June. All told, the Mississippi River was above flood stage for nearly two and a half to three months.

The impacts on the lives of residents, businesses, and wildlife were and continue to be significant. Numerous homes and businesses were damaged or destroyed, all of which were contained within the main levee system. In Vicksburg and the remainder of Warren County, where there is no levee protection, 40 residences had major damage with another 250 with minor damages. The backwater flooding in Yazoo and Humphreys counties had 50 residences with major damage and 425 with minor damage. Washington County had nearly 60 homes and 19 agricultural buildings destroyed. All tallied, more than 1500 buildings in Mississippi were affected with nearly 400 being destroyed or incurring major damage.

**Figure 4. The Mississsippi River at Greenville. Taken on May 18, 2011 when the river stage was 64 feet.**

**Figure 5. The Mississippi River at Vicksburg. Taken on May 19, 2011 when the stage was 57.1 feet.**

**Figure 6. The Mississippi River at Vicksburg. Taken on May 19, 2011 when the stage was 57.1 feet.**

**Figure 7. The Mississippi River at Vicksburg. Taken on May 19, 2011 when the stage was 57.1 feet.**

The recovery assistance has been swift in both Mississippi and Louisiana with the National Guard, Salvation Army, and the American Red Cross all providing assistance to those in need. Over $530,000 has been received by Mississippi River Flood Victims in Federal Housing Assistance to cover temporary housing expenses.

**Figure 8. The Mississippi River at Natchez. Taken on May 19, 2011 when the stage was 61.9 feet.**

However, the recovery to replace homes, businesses, farms, and especially personal belongings are continuing this summer.

**Figure 9. The Mississippi River at Natchez. Taken on May 19, 2011 when the stage was 61.9 feet.**

The NWS Jackson office wishes everyone the best that were adversely affected by the Great Flood of 2011 along the Mississippi River and backwater locations and vow our continued commitment and resources to protecting life and property.

# NEW CLIMATE NORMALS UNVEILED

*By Daniel Lamb, Meteorological Intern and Climate Focal Point*

**What are climate normals?**

You might often hear or see meteorologists talk about above or below normal temperatures or rainfall, but have you ever wondered where we get the "normal" values that we use for our comparisons? The answer is the National Climatic Data Center (NCDC) in Asheville, North Carolina. Think of the staff of NCDC as the keepers of the National Weather Service's massive vault of weather data. All of the climatological data we collect each day, including temperatures, precipitation, snowfall, and agricultural weather data, are all stored in the archives at NCDC.

Every ten years, NCDC takes this data and creates an updated set of normals for several weather parameters, including temperatures, precipitation, snowfall, snow depth, heating degree days, cooling degree days, cloud cover, dewpoint temperatures, winds, heat indices, and wind chills. The normals are available in yearly, seasonal, monthly, daily, and in some cases, hourly intervals for over 8,000 locations across the United States. The normals are based on weather information from a 30 year period, so the newly released set of normals is based on data from 1981 to 2010.

The weather parameters measured at each site determine the types of normals that are available for that location. For instance, at cooperative weather observing sites that only measure daily rainfall and snowfall, normal rainfall and snowfall information is available. On the other hand, at a large airport, where more data is collected on a more routine basis, a much wider array of normals information is available.

**How much did the normals change from the last set to the new set?**

Nationally, the average temperature increased by 0.5°F. This increase was driven by milder wintertime temperatures, particularly over the northern United States. Warm season temperatures did increase in the western United States, but changed little or decreased across much of the rest of the country.

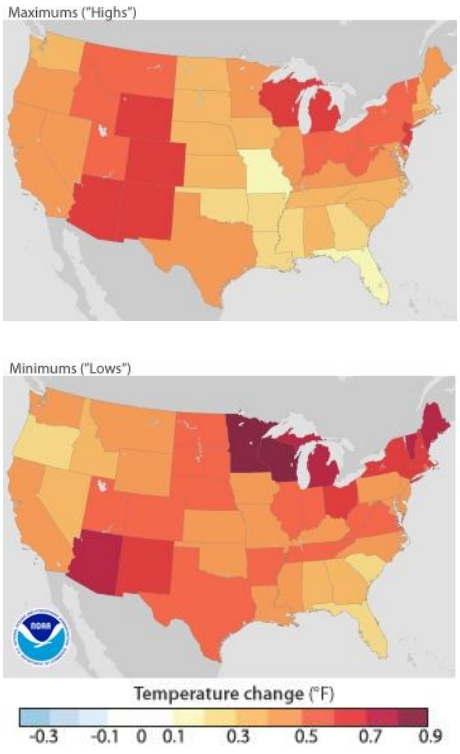


**Figure 1(top) and 2(bottom). Statewide changes in annual "normal" temperature from the 1971-2000 period to the 1981-2010 period. Top figure depicts changes in the maximum temperatures and the bottom figure shows the changes in the minimum temperatures.**

At Jackson, the average yearly temperature also increased by around 0.5°F. Perhaps the biggest reason for this increase is because several cool years in the late 1970s are no longer a part of the normal period. This includes 1979, which was the coldest year on record in Jackson, and two other years in the top 10 coldest years on record. On the other hand, the new 1981-2010 normals include three of the top 20 warmest years on record at Jackson, including 1990, 1998, and 2007. Yearly precipitation decreased by 1.81" at Jackson. Again, this was due to a loss of significantly wetter than normal years from the normals. The new normals period no longer includes wettest year on record (1979), and it no longer includes four of the top 20 wettest years on record at Jackson. Instead, it now includes the second driest year on record (2007).

| | '81-'10 Normals | '71-'00 Normals | Diff. |
|---|---|---|---|
| Jan. | 45.7 | 45.0 | +0.7 |
| Feb. | 49.5 | 49.2 | +0.3 |
| Mar. | 56.9 | 56.8 | +0.1 |
| Apr. | 64.1 | 63.4 | +0.7 |
| May | 72.3 | 71.5 | +0.8 |
| Jun. | 79.0 | 78.5 | +0.5 |
| Jul. | 81.6 | 81.4 | +0.2 |
| Aug. | 81.3 | 80.9 | +0.4 |
| Sept. | 75.6 | 75.5 | +0.1 |
| Oct. | 65.1 | 64.4 | +0.7 |
| Nov. | 55.7 | 54.8 | +0.9 |
| Dec | 47.8 | 47.6 | +0.2 |
| Year | 64.6 | 64.1 | +0.5 |

**Table 1. Jackson average temperature normals for the period 1971-2000 and the new set for 1981-2010. Also calculated is the difference between each set for each month and as a year.**

At Meridian, it was a different story. The average yearly temperature decreased by around 1°F. All annual and monthly average, high, and low temperature normals decreased from the previous set of normals. In spite of the colder years in the late 1970s, the loss of these years from the normals was apparently offset by a few warmer years in the early 1970s. Normal yearly precipitation decreased by 2.49". Three of the top ten wettest years on record at Meridian (including the wettest year 1973, the 4th wettest 1979, and the 8th wettest 1977) are no longer in the normals period.

**Where to find the new normals**

National Weather Service offices around the country began using the new 1981-2010 normals in our climate products on the afternoon of August 1st. This will include the Daily Climate Report (CLI), Monthly Climate Report (CLM), and Preliminary Local Climatological Data (CF6) products for Jackson International Airport (JAN), Meridian (MEI), Greenville (GLH), Greenwood (GWO), Hattiesburg (HBG), and Vicksburg-Tallulah (TVR). The CLI and CLM products show the updated normals period in the location indicated by the example product in Figure 3.

We have created a web page (http://www.srh.noaa.gov/jan/?n=climate1981-2010normals) highlighting several of the new monthly and yearly temperature, precipitation, and snowfall normals for Jackson and Meridian. There are also links to the new normals for several sites across central and

southern Mississippi, northeastern Louisiana, and southeastern Arkansas. If you have any questions with regards to accessing or interpreting the new climate normals, please contact our office and we will be happy to answer any questions you may have!

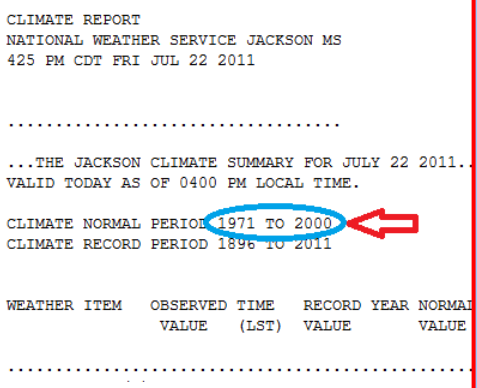


**Figure 3. Period of normals can be found on the top of our climate products.**

## *Questions or Comments?*

***Contact us at:***

National Weather Service
234 Weather Service Drive
Flowood, MS 39232
601-936-2189
sr-jan.webmaster@noaa.gov
www.srh.noaa.gov/jan

# BEAT THE HEAT…CHECK THE BACKSEAT!

*By Joanne Culin, Forecaster/Editor*

It is no secret that the summer months across the South are hot! One of the biggest weather related risks during the summer is the possibility of a child dying in a vehicle from heat stroke. The temperature inside a vehicle can rise 20 degrees in as little as 10 minutes, and 50 degrees in an hour. In the ArkLaMiss region, where temperatures are in the 90s almost every day in the summer, this means that temperatures will reach well over 100 degrees inside a vehicle in a very short period of time, and will approach 150 degrees within an hour. This can cause hyperthermia (heat stroke) in literally a matter of minutes, particularly in children, whose body temperatures warm at a rate 3 to 5 times faster than an adult's.

In the last 12 years, over 500 children have died nationwide from heat stroke suffered while in a vehicle. Half of these were children that were forgotten by a parent or other caregiver, and nearly 20 percent died when parents knowingly left their child in a vehicle. The remaining percentage of children died when they were playing in an unattended vehicle. Of these 500 fatalities, 10 occurred in Mississippi, 14 in Louisiana, and 12 in Arkansas. So far in 2011, 22 children have died nationwide from heat stroke while in a vehicle, while in 2010 there were 49 children who died. On average, there are about 38 deaths per year from heat stroke caused from being left in a car. 75% of the children are 2 years old or less. These children do not know how to get out of the car without help from an adult.

All of these tragic deaths are preventable. To help bring awareness to this issue, the NWS is using the slogan "Beat the Heat, Check the Backseat" to remind people to be sure they remember small children who may be in a car seat, and to never leave children unattended in a vehicle, even for a few moments.


Some basic safety recommendations:

- **NEVER LEAVE A CHILD UNATTENDED IN A VEHICLE. NOT EVEN FOR A MINUTE!**
- **IF YOU SEE A CHILD UNATTENDED IN A HOT VEHICLE CALL 9-1-1.**
- Be sure that all occupants leave the vehicle when

unloading. Don't overlook sleeping babies.

- Always lock your car and ensure children do not have access to keys or remote entry devices. If a child is missing, check the car first, including the trunk. Teach your children that vehicles are never to be used as a play area. **IF A CHILD IS MISSING, ALWAYS CHECK THE CAR FIRST!**
- Keep a stuffed animal in the car seat and when the child is put in the seat place the animal in the front with the driver.
- Or place your purse or briefcase in the back seat as a reminder that you have your child in the car.
- Make "look before you leave" a routine whenever you get out of the car.
- Have a plan that your childcare provider will call you if your child does not show up for school.
- Remember that pets should also never be left in a vehicle during the summer months.

For more information on heat safety, please visit our website at wwww. srh.noaa.gov/jan. Much of the information and statistics contained in this article was provided by Jan Null, Certified Consulting Meteorologist. Jan has been researching the affects of hyperthermia and child fatalities from it.

# NWS JACKSON IS NOW ON FACEBOOK!

*By Joanne Culin, Forecaster/Editor*

If you are like a lot of people in this world, you likely have a Facebook account. Some of the 600 million active users of the site log in to keep track of their friends, family, or to reconnect with an old love. Others may log-in just to keep tabs on their kids, play games, or post pictures. Did you know that now residents of the ArkLaMiss can find out weather information as well? NWS Jackson, as well as many other National Weather Service offices across the country, have joined Facebook with the goal of providing weather information to many more of the ArkLaMiss residents via one of the hottest social media tools in today's society. We provide pertinent weather information and this will be a place that residents who "like" our page can post storm reports, as well as upload pictures and video of weather, storm damage, hail, tornadoes, etc. Over the past couple of months, we have provided information regarding storm surveys, Mississippi River flooding, as well as the record heat. We are excited to be able to reach out to you on one of the most popular and fastest growing websites around!

The NWS in Jackson went live on Facebook on April 16th and since that time, we have over 4450 fans of our page. If you would like to become one of our "fans", just log into Facebook and search for US National Weather Service Jackson, MS. Once on our page, just hit "like" and you will be automatically updated on your own Facebook news feed when we have posted weather information. It is just another way we can service the residents of the ArkLaMiss region with life-saving weather information!

## Need a Guest Speaker?

It is getting to be that time of year when schools resume and fall severe weather season is just around the corner. Did you know that forecasters at the NWS in Jackson can come and give talks to your school, civic organization, church group, scout troop, or any gathering of people interested in learning more about the weather? Also, if you are interested in spotting storms, we give storm spotter classes.

If you are interested in having a meteorologist give a weather talk, please call Steve Wilkinson at 601-936-2189.

# ABOUT THE STORM PREDICTION CENTER

*By Ariel Cohen, SPC Mesoscale Assistant Forecaster*

Living in the ArkLaMiss region, you have likely become accustomed to hearing about Tornado and Severe Thunderstorm Watches – alerts to inform you that conditions are favorable for the development of severe weather during a several-hour duration. These watches are issued by the Storm Prediction Center (SPC) in Norman, Oklahoma, which is part of the National Centers for Environmental Prediction (NCEP) of the National Weather Service (NWS). Another one of these NCEP centers was discussed in the Summer 2009 edition of the *ArkLaMiss Observer*: the National Hurricane Center (NHC) in Miami, Florida. Similar to the NHC, the SPC is responsible for monitoring and providing forecasts for significant weather phenomena across a large area. More specifically, the SPC focuses on thunderstorms, along with heavy rain, significant winter precipitation, and fire weather. In this article, we will discuss some of the products that the SPC issues and how this information can be used to help protect life and property.

A couple of the most visible products that the SPC issues are Tornado and Severe Thunderstorm Watches, which are routinely coordinated prior to their issuance between NWS Forecast Offices and the SPC. These watches usually cover dozens of counties or parishes during durations of at least six hours and indicate that conditions are favorable for the development of severe weather within or close to the watch area. Forecasters at the SPC constantly evaluate weather observations and computer model output to gage the potential for severe weather, and issue watches when conditions warrant. Figure 1 depicts a Tornado Watch, which was issued for portions of the ArkLaMiss and Mid-South regions for the April 24, 2010 severe weather event that included the Yazoo City EF-4 tornado. Counties in the watch area are outlined in red and are overlaid on a radar image at the initial time of the watch. This watch was a special type of watch called a Particularly Dangerous Situation Tornado Watch. The term "Particularly Dangerous Situation" highlights the potential for significant severe weather within the watch area. Note the table below the map, which indicates the SPC's confidence that particular hazard elements will occur in the watch area. Remember, if a Tornado or Severe Thunderstorm watch is issued for your area, you should be alert for rapidly changing weather conditions, and be ready to take immediate action if warnings are issued.


**Figure 1. A Particularly Dangerous Situation Tornado Watch issued by the SPC for a portion of the ArkLaMiss region and mid-south region.**

Prior to the occurrence of severe weather, the SPC issues severe weather outlooks (convective outlooks) out to 8 days from the present to identify areas of enhanced risk of severe weather both graphically and textually. Various categories of risk are outlined in these outlooks: general thunderstorm risk, slight risk, moderate risk, and high risk. Figure 2 provides an example of a severe weather outlook. This figure indicates a high risk for severe weather across a large part of the ArkLaMiss region and represented the severe weather outbreak on April 24, 2010. Such outlooks provide the big picture view of your risk to experience severe weather on a particular day. In addition to categorically depicting the severe weather risk in these outlooks, SPC forecasters also issue graphical products that depict probabilities of particular severe weather elements occurring. Figure 3 shows the probabilities of

tornadoes, severe winds, and hail for the same day as those shown in Figure 2. Hatched areas on these probabilistic charts indicate the potential for significantly severe weather.

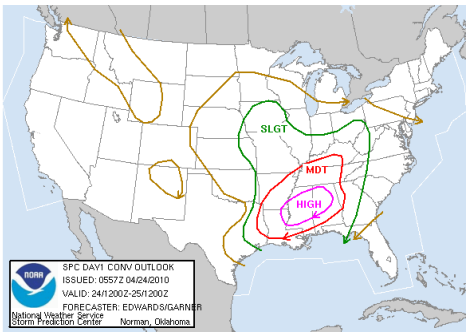


**Figure 2. Day-1 convective outlook for April 24 depicting a High Risk for severe thunderstorms across a large part of the ArkLaMiss region.**

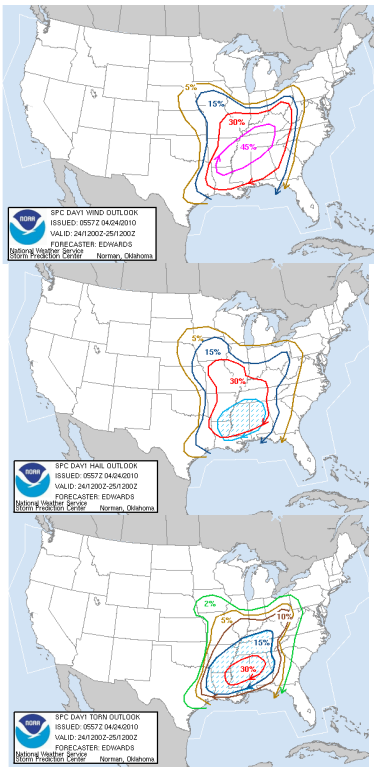


**Figure 3. Day-1 severe weather probability outlook for April 24 for tornadoes, severe winds, and large hail.**

The SPC also issues outlooks of thunderstorm chances in what are known as "Enhanced Thunder Outlooks." These outlooks delineate areas of particular thresholds of thunderstorm probabilities. Figure 4 shows an example of an Enhanced Thunder Outlook, specifically from April 24, 2010.

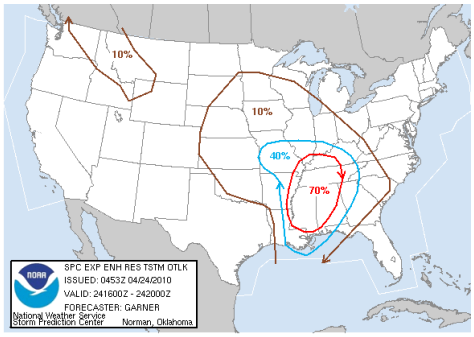


**Figure 4. An example of an Enhanced Thunder Outlook, specifically from April 24, 2010.**

In addition to the SPC's focus on thunderstorms and severe weather, the SPC also issues Fire Weather Outlooks, which highlight areas of potentially dangerous fire weather conditions based on anticipated surface wind speeds and relative humidity values. These outlooks provide a heads up on what areas SPC forecasters expect wildfire potential to reach critical thresholds. As with severe weather, wildfires can pose a major hazard to life and property, and forecasting their potential occurrence helps forestry commissions and emergency management officials prepare for potential emergency response to wildfires. Figure 5 shows a Fire Weather Outlook for October 15, 2010, highlighting portions of the southeastern United States as experiencing critical wind speed and relative humidity thresholds that day.

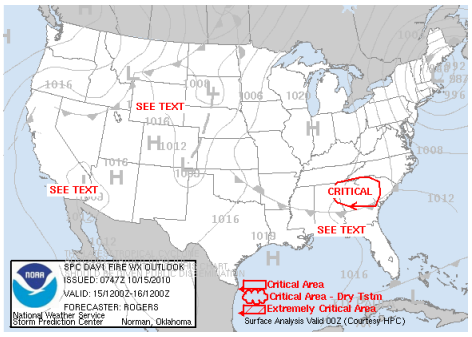


**Figure 5. Fire Weather Outlook for October 15, 2010 depicting an area of the southeastern United States where critical fire weather conditions are expected to occur.**

Finally, the SPC is responsible for issuing Mesoscale Discussions, which focus on severe weather, winter weather, and heavy rainfall impacts over relatively smaller regions of the country (e.g., portions of the state of Mississippi). These discussions provide an evaluation of the key weather features that are at work in producing hazardous weather events at a smaller scale, as well as their anticipated evolution during the following few hours. Each Mesoscale Discussion is accompanied by a graphical image that depicts the most salient features highlighted in the text discussion. Figure 6 provides an example of an image accompanying a Mesoscale Discussion from the April 24, 2010 severe weather outbreak across the ArkLaMiss region.

To access any of the information described in this article, please visit the Storm Prediction Center's website at

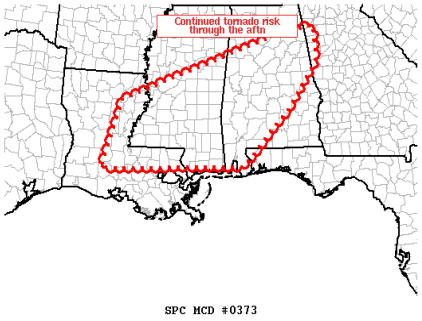


**Figure 6. The image accompanying a Mesoscale Discussion issued during the April 24, 2010 severe weather outbreak across the ArkLaMiss region.**

http://www.spc.noaa.gov. Figure 7 shows a screen capture of the SPC website, and you can click on any of the links on the left panel overview panel to access the products described in this article, as well as many additional forecast tools and research projects that SPC forecasters have produced.

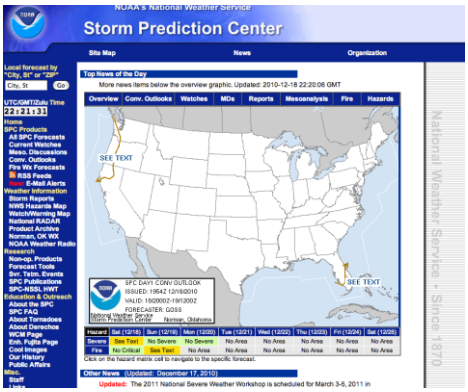


**Figure 7. The SPCs website.**

# Tornado Damage Versus Straight Line Wind Damage

*By Steve Wilkinson, Warning Coordination Meteorologist*

When it comes to wind damage caused by thunderstorms, there is a lot of confusion concerning the methods used by the National Weather Service. Many people assume that all wind damage that occurs must be from tornadoes. Others believe that serious damage is caused by tornadoes, while weaker damage is caused by straight line winds. However, straight line winds can cause damage as intense as some tornadoes. This article will examine the methods employed to differentiate between the two.

## Tornadoes

Whenever reports or radar indicate the possibility of a tornado, a damage survey is conducted by the National Weather Service. The main purpose of the survey is to determine if it was caused by a tornado and if so, the strength, length, and width are estimated.

The following damage patterns help identify the storm as a tornado:

1. **Convergence in the damage pattern** – since a tornado by definition is rotating; debris will be thrown in different directions. Objects that encounter the right side of the tornado will be thrown left toward the center of the tornado while objects that encounter the left side of the tornado will be thrown right toward the center also. This creates a damage pattern that converges toward the middle.

2. **Objects thrown in the opposite direction of the tornado's motion** – each tornado has a forward motion and speed. In many cases, the winds on the left side of the tornado are strong enough to throw objects back in the opposite direction of storm's motion.

3. **Focus** – while there are some exceptions, most tornadoes are relatively narrow. Therefore, the associated damage pattern is narrow as well. Thus, a tornado damage path will usually be narrower than straight line winds.

4. **Eyewitness and/or video evidence** – Occasionally, an eyewitness report, picture, or video confirms the presence of a tornado. This evidence is often consistent with the other methods listed above.

**Figure 1. Downed trees in the Great Smoky Mountain National Park from an EF4 tornado. Photo courtesy of the National Park Service.**

## Straight Line Winds

Similar to tornadoes, there are a few methods used to determine winds to be straight line in nature. The following damage patterns help identify the storm damage as from straight line winds:

1. **Scattered nature of damage** – unlike a tornado, straight line winds can occur over a relatively large area, sometimes many miles in width. Within the area affected by the winds, the damage is much more scattered than a tornado.

2. **Damage blown in the same direction** – straight line winds will blow the damage in the same direction on the small scale.

3. **Divergence in the damage pattern** – straight line winds sometimes cause damage that falls in a pattern pushing away from the center of the damage. This is often seen when one looks at the damage on the broad scale.

**Figure 2. Damage path from straight line winds. Notice the way the trees are blown in the same direction.**

# EXTREME WEATHER WARNINGS

*By Ed Agre, Forecaster*

Hazardous weather warnings are a critical component of the National Weather Service mission and are under frequent scrutiny for areas in which we can improve our effectiveness in communicating life-saving information. In order to highlight the very rare events where multiple injuries and/or fatalities become highly likely from a weather event, there are 3 extreme weather warnings we would like to highlight: 1) Tornado Emergencies, 2) Flash Flood Emergencies, 3) Extreme Wind Warnings. These warnings are actually upgraded versions of the somewhat more common: 1) Tornado Warning, 2) Flash Flood Warning, and 3) Tropical Storm/Hurricane Wind Warnings respectively.

The Tornado Emergency will be issued by our office when we believe there is a heightened risk for a killer or violent tornado of EF3 rating or greater. In these very rare cases, we have to be very confident that extreme danger exists to the public based on: a) radar showing strong indications of a strong/violent tornado, b) reliable reports of significant damage or spotters reporting a large tornado, c) environmental conditions supporting violent tornadoes, especially when a Particularly Dangerous Tornado Watch is in effect. In most cases, the Tornado Emergency will be instituted after an initial Tornado Warning is already in effect. A few recent examples of issuing this warning were the April 2010 Tornado Emergency for Yazoo City, as well as for some of the major tornadoes during the April 27, 2011 outbreak.

The second type of extreme weather warning is the Flash Flood Emergency. This warning is reserved for those rare situations where these criteria are met: a) reliable reports of a major/high risk dam failure, or b) extremely heavy rainfall has occurred in gages or on radar estimations which will persist for several hours, c) and clear evidence of life-threatening situations due to rapid flooding of homes, cars being swept away, along with high water rescue operations. In most cases, the Flash Flood Emergency would be issued as a follow-up to an initial Flash Flood Warning. We would anticipate these type of enhanced warnings in cases where Tropical systems stall over an area or a dam breaks above a large population center.

The final extreme weather warning we'll look at is the Extreme Wind Warning. This warning will be issued for the core of major (category 3 or greater) hurricanes as the eyewall moves inland. The rare situations when these criteria are likely include: a) Category 3 hurricane or greater moving inland over our southern counties/parishes,
b) sustained winds in the core reach 100kts or 115mph or greater that are expected to occur within the following hour. This warning should normally be valid for either 2 or 3 hours at a time for any one county or parish. The most recent local example of this warning would have been during the 2005 Katrina landfall in southeast Mississippi.

The National Weather Service remains on alert 24 hours a day looking for those weather systems that could produce not only dangerous but, also the rare extreme events that could impact you and your family. Be sure to listen in to your local NOAA All Hazards Weather Radio for the latest up-to-date information on extreme weather, as well as visiting our webpage or Facebook page.

# SEVERE WEATHER AND FLOOD EVENT OF MARCH 8TH-9TH, 2011

*By Marty Pope, Senior Hydrologist*

A potent storm system combined with abundant moisture over the ArkLaMiss region to bring nearly 24 hours of showers and thunderstorms, beginning during the day on March 8th and continuing through the early morning hours of March 9th. With rich moisture flowing north from the Gulf of Mexico, many of the storms were efficient rain producers, bringing the risk of flash flooding and river flooding. Many locations along and southeast of the Natchez Trace Parkway corridor had already seen as much as 3 to 4 inches of rain just 3 to 4 days prior to this event. Along with the flooding, ample wind shear and strong forcing from an upper disturbance and approaching cold front brought a risk for severe thunderstorms. The primary hazards from these thunderstorms was from damaging winds and tornadoes. The best combination of shear and instability was south of Interstate 20.

Showers began to affect the ArkLaMiss region during the morning of the 8th. These showers increased in coverage and intensity during the afternoon and evening hours. Thunderstorms moved repeatedly over the same locations, which allowed rainfall amounts to add up quickly. Numerous Flash Flood Warnings
were issued across South Mississippi. The most significant flash flooding occurred across Lincoln County and from Covington, northern Jones County, and Jasper counties into Clarke County where rainfall from 7.00 to 8.00 inches was observed. A "Flash Flood Emergency" was issued across Jasper and Clarke counties after reports of flooded streets and water rescues were received by the NWS Jackson. Water entered homes and businesses across this area, especially around Heidelberg and Quitman. Flooding produced significant damage to roadways, bridges, and culverts. Damages were estimated around 1.5 million dollars. Severe weather and flooding continued into the early hours of the 9th. In Hinds County, two tornadoes touched down just after midnight.

Even though rainfall and severe weather had ended across the area on the morning of the 9th, the flood threat was just beginning in Jones County Mississippi. Over the next 48 hours, runoff from the excessive rainfall across Jasper County moved downstream into Jones County. Major flooding occurred along the Bogue Homa, Tallahoma, and Tallahala creeks. Over 100 homes were impacted by floodwater, with most of the flooding in the Laurel, MS area caused by the Tallahala Creek.

**Figure 1. Tallahala Creek at Sandersville.**

**Figure 2. Tallahala Creek near Laurel off of Highway 11. Water is covering the road leading into the stable area.**

Tallahala Creek at Laurel crested at a 20 year high of 20.73 feet on the 11th, which was almost 8 feet above flood stage. Flood damages were estimated at several million dollars across Jones County.

**Figure 3. Tallahala Creek near Laurel. This location is off Highway 15 and Slaughters Pen Road.**

Storm total rainfall amounts were quite high as storms moved repeatedly over the same locations. Some higher rainfall totals from 9th and 10th: 7.80 inches at Quitman, MS; 7.56 inches at Crandall, MS; 7.13 inches at Shubuta, MS; 7.05 inches at Pat Harrison Waterway's Archusa Water Park, MS; 6.61 inches at Hattiesburg, MS; 6.50 inches at Brookhaven, MS; 6.47 inches at Purvis, MS; and 6.45 inches at Bay Springs, MS.

**Figure 4. Bogue Homa Creek along Township Road.**

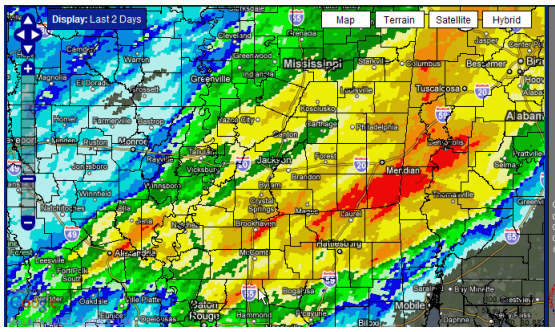


**Figure 5. Storm total rainfall amounts from March 9-10, 2011. Notice the higher amounts, depicted by the red and orange colors on the image. These are located mainly in the east and southeastern parts of the ArkLaMiss.**

# Doppler on Wheels Comes to Jackson!

*By Joanne Culin, Forecaster/Editor*

Most people are aware of Doppler radars as being stationary objects and some may have driven by the one serviced by the NWS in Jackson off of I-20 in Brandon, MS. However, it is not every day when you see a Doppler radar passing you on the highway on the bed of a truck. This sight was the case around the Jackson area from the end of February through the beginning of March as the Doppler on Wheels came to the Jackson area.

The Doppler on Wheels (DOW) are a fleet of radar trucks maintained

**Figure 1. The Doppler on Wheels on display. This is a radar dish on the back of a small flatbed of a truck.**

by the Center for Severe Weather Research based in Boulder, CO, with the funding mainly provided by the National Science Foundation. The project consists of three trucks mounted with Doppler weather radar dishes, a support vehicle, and three instrumented SUV/Pickups which deploy instrumented pods in tornadoes and hurricanes. The goal of the DOW is to collect as much detailed information on severe weather and other weather as possible using the mobile Doppler vehicles. DOWs are mobile, so they can often operate at a much closer range to storms than the standard fixed Doppler radar. They can also scan at a faster rate and at more levels, and this allows scientists to observe quick-evolving storms and tornadoes with much more spatial and temporal detail. By studying wind fields, it is hoped to understand the tornado structure and how it builds and maintains its life cycle.

**Figure 2. The inside of the truck. Many computer screens to display data collected.**

In addition, portable instruments called Sticknets are placed in the path of the tornado or hurricane in the hopes of getting some ground observations. DOWs have observed 141 tornadoes at close range, and intercepted the eyes of 11 hurricanes (most recently Ike and Gustav in 2008). Those familiar with the VORTEX and VORTEX2 projects seen on The Weather Channel over the past couple of springs may remember seeing these radars on camera many times as part of the projects.

In addition to scientific research, the DOW radars also are used for radar meteorology education. Colleges and universities can request a DOW for short duration (2-3 weeks) for use in their meteorology curriculum. CSWR provides a radar technician to train professors and students on DOW operations, driving and deployments and a scientist to assist in interpretation of the data and provide specialized seminars in radar technology and meteorological research using radars. The university is responsible for designing simple radar experiments and collecting the data. Moreover, while the DOW is in residence at the University, community outreach in high schools, local AMS (American Meteorological Society) chapters, etc. is encouraged.

Jackson State University requested the DOW for such a project from 20 February to 10 March. During this time the DOW sampled several events, including a squall line. These data currently are being used by students to better understand radar observations, storm dynamics, and optimal sampling and deployment strategies. Dr. Karen Kosiba, the scientist who came to JSU, taught the students how to use radar editing software, gave a department seminar, gave a seminar at the local AMS chapter, and visited a local high school with the radar truck. Those in attendance at the local AMS meeting, held at a local restaurant at the Ross Barnett Reservoir in Ridgeland, got to take a sneak peek inside the DOW.

**Editor:**

*Joanne Culin, Forecaster*

**Contributors:**

*Alan Gerard, Meteorologist-In-Charge*
*Jared Allen, Forecaster*
*Marty Pope, Senior Service Hydrologist*
*Daniel Lamb, Meteorological Intern*
*Ariel Cohen, SPC Mesoscale Forecaster*
*Steve Wilkinson, Warning Coordination Meteorologist*
*Ed Agre, Forecaster*